

**Appendix A to Subpart C of Part 141 - Alternative Testing Methods Approved for Analyses Under the Safe Drinking Water**

**Act.** Only the editions stated in the following table are approved.

<b>Alternative testing methods for contaminants listed at 40 CFR 141.21(f)(3)</b>		
Organism	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
Total Coliforms	Total Coliform Fermentation Technique	9221 A, B
	Total Coliform Membrane Filter Technique	9222 A, B, C
	Presence-Absence (P-A) Coliform Test	9221 D
	ONPG-MUG Test	9223

<b>Alternative testing methods for contaminants listed at 40 CFR 141.23 (k)(1)</b>					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>
Alkalinity	Titrimetric		2320 B		
Antimony	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>			
Arsenic	Atomic Absorption; Furnace		3113 B		
	Hydride Atomic Absorption		3114 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			

<b>Alternative testing methods for contaminants listed at 40 CFR 141.23 (k)(1)</b>					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>
Barium	Inductively Coupled Plasma		3120 B		
	Atomic Absorption; Direct		3111 D		
	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Beryllium	Inductively Coupled Plasma		3120 B		
	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Cadmium	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Calcium	EDTA titrimetric		3500-Ca B		
	Atomic Absorption; Direct Aspiration		3111 B		
	Inductively Coupled Plasma		3120 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Chromium	Inductively Coupled Plasma		3120 B		
	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			

<b>Alternative testing methods for contaminants listed at 40 CFR 141.23 (k)(1)</b>					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>
Copper	Atomic Absorption; Furnace		3113 B		
	Atomic Absorption; Direct Aspiration		3111 B		
	Inductively Coupled Plasma		3120 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Conductivity	Conductance		2510 B		
Cyanide	Manual Distillation followed by				D2036-06 A
	Spectrophotometric, Amenable		4500-CN <sup>-</sup> G		D2036-06 B
	Spectrophotometric Manual		4500-CN <sup>-</sup> E		D2036-06 A
	Selective Electrode		4500-CN <sup>-</sup> F		
Fluoride	Ion Chromatography		4110 B		
	Manual Distillation; Colorimetric SPADNS		4500-F <sup>-</sup> B, D		
	Manual Electrode		4500-F <sup>-</sup> C		D1179-04 B
	Automated Alizarin		4500-F <sup>-</sup> E		
Lead	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Magnesium	Atomic Absorption		3111 B		
	Inductively Coupled Plasma		3120 B		
	Complexation Titrimetric Methods		3500-Mg B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Mercury	Manual, Cold Vapor		3112 B		

<b>Alternative testing methods for contaminants listed at 40 CFR 141.23 (k)(1)</b>					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>
Nickel	Inductively Coupled Plasma		3120 B		
	Atomic Absorption; Direct		3111 B		
	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Nitrate	Ion Chromatography		4110 B		
	Automated Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> F		
	Manual Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> E		
	Ion Selective Electrode		4500-NO <sub>3</sub> <sup>-</sup> D		
Nitrite	Ion Chromatography		4110 B		
	Automated Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> F		
	Manual Cadmium Reduction		4500-NO <sub>3</sub> <sup>-</sup> E		
	Spectrophotometric		4500-NO <sub>2</sub> <sup>-</sup> B		
Orthophosphate	Ion Chromatography		4110 B		
	Colorimetric, ascorbic acid, single reagent		4500-P E	4500-P E-99	
	Colorimetric, Automated, Ascorbic Acid		4500-P F	4500-P F-99	
pH	Electrometric		4500-H <sup>+</sup> B		
Selenium	Hydride-Atomic Absorption		3114 B		
	Atomic Absorption; Furnace		3113 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			

<b>Alternative testing methods for contaminants listed at 40 CFR 141.23 (k)(1)</b>					
Contaminant	Methodology	EPA Method	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>	ASTM <sup>4</sup>
Silica	Colorimetric				D859-05
	Molybdosilicate		4500-SiO <sub>2</sub> C		
	Heteropoly blue		4500-SiO <sub>2</sub> D		
	Automated for Molybdate-reactive Silica		4500-SiO <sub>2</sub> E		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Inductively Coupled Plasma		3120 B		
Sodium	Atomic Absorption; Direct Aspiration		3111 B		
	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
Temperature	Thermometric		2550		

<b>Alternative testing methods for contaminants listed at 40 CFR 141.24 (e)(1)</b>			
Contaminant	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>
Carbofuran	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection	6610 B	6610 B-04
Oxamyl	High-performance liquid chromatography (HPLC) with post-column derivatization and fluorescence detection	6610 B	6610 B-04

<b>Alternative testing methods for contaminants listed at 40 CFR 141.25(a)</b>			
Contaminant	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	ASTM <sup>4</sup>
Naturally Occurring:			
Gross alpha and beta	Evaporation	7110 B	

<b>Alternative testing methods for contaminants listed at 40 CFR 141.25(a)</b>			
Contaminant	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>	ASTM <sup>4</sup>
Naturally Occurring:			
Gross alpha	Coprecipitation	7110 C	
Radium 226	Radon emanation	7500-Ra C	
	Radiochemical	7500-Ra B	
Radium 228	Radiochemical	7500-Ra D	
Uranium	Radiochemical	7500-U B	
	ICP-MS		D5673-05
	Alpha spectrometry	7500-U C	
Man-Made:			
Radioactive Cesium	Radiochemical	7500-Cs B	
	Gamma Ray Spectrometry	7120	
Radioactive Iodine	Radiochemical	7500-I B	
		7500-I C	
		7500-I D	
	Gamma Ray Spectrometry	7120	
Radioactive Strontium 89, 90	Radiochemical	7500-Sr B	
Tritium	Liquid Scintillation	7500- <sup>3</sup> H B	
Gamma Emitters	Gamma Ray Spectrometry	7120 7500-Cs B 7500-I B	

<b>Alternative testing methods for contaminants listed at 40 CFR 141.74(a)(1)</b>		
Organism	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
Total Coliform	Total Coliform Fermentation Technique	9221 A, B, C
	Total Coliform Membrane Filter Technique	9222 A, B, C
	ONPG-MUG Test	9223
Fecal Coliforms	Fecal Coliform Procedure	9221 E
	Fecal Coliform Filter Procedure	9222 D
Heterotrophic bacteria	Pour Plate Method	9215 B
Turbidity	Nephelometric Method	2130 B

<b>Alternative testing methods for disinfectant residuals listed at 40 CFR 141.74(a)(2)</b>		
Residual	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
Free Chlorine	Amperometric Titration	4500-CI D
	DPD Ferrous Titrimetric	4500-CI F
	DPD Colorimetric	4500-CI G
	Syringaldazine (FACTS)	4500-CI H
Total Chlorine	Amperometric Titration	4500-CI D
	Amperometric Titration (Low level measurement)	4500-CI E
	DPD Ferrous Titrimetric	4500-CI F
	DPD Colorimetric	4500-CI G
	Iodometric Electrode	4500-CI I
Chlorine Dioxide	Amperometric Titration	4500-ClO <sub>2</sub> C
	Amperometric Titration	4500-ClO <sub>2</sub> E
Ozone	Indigo Method	4500-O <sub>3</sub> B

<b>Alternative testing methods for contaminants listed at 40 CFR 141.131(b)(1)</b>		
Contaminant	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
HAA5	LLE (diazomethane)/GC/ECD	6251 B
Chlorite – daily monitoring as prescribed in 40 CFR 141.132(b)(2)(i)(A)	Amperometric Titration	4500–ClO <sub>2</sub> E

<b>Alternative testing methods for disinfectant residuals listed at 40 CFR 141.131(c)(1)</b>		
Residual	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
Free Chlorine	Amperometric Titration	4500-Cl D
	DPD Ferrous Titrimetric	4500-Cl F
	DPD Colorimetric	4500-Cl G
	Syringaldazine (FACTS)	4500-Cl H
Combined Chlorine	Amperometric Titration	4500-Cl D
	DPD Ferrous Titrimetric	4500-Cl F
	DPD Colorimetric	4500-Cl G
Total Chlorine	Amperometric Titration	4500-Cl D
	Low level Amperometric Titration	4500-Cl E
	DPD Ferrous Titrimetric	4500-Cl F
	DPD Colorimetric	4500-Cl G
	Iodometric Electrode	4500-Cl I
Chlorine Dioxide	Amperometric Method II	4500–ClO <sub>2</sub> E

<b>Alternative testing methods for disinfectant residuals listed at 40 CFR 141.131(c)(2), if approved by the State</b>		
Residual	Methodology	Method
Free Chlorine	Test Strips	Method D99-003 <sup>5</sup>

<b>Alternative testing methods for parameters listed at 40 CFR 141.131(d)</b>		
Parameter	Methodology	SM 21 <sup>st</sup> Edition <sup>1</sup>
Total Organic Carbon (TOC)	High Temperature Combustion	5310 B
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C
	Wet Oxidation	5310 D
Specific Ultraviolet Absorbance (SUVA)	Calculation using DOC and UV <sub>254</sub> data	
Dissolved Organic Carbon (DOC)	High Temperature Combustion	5310 B
	Persulfate-Ultraviolet or Heated Persulfate Oxidation	5310 C
	Wet Oxidation	5310 D
Ultraviolet absorption at 254 nm (UV <sub>254</sub> )	Spectrophotometry	5910 B

<b>Alternative testing methods for contaminants listed at 40 CFR 141.402(c)(2)</b>				
Organism	Methodology	SM 20 <sup>th</sup> Edition <sup>6</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>
<i>E. coli</i>	Colilert		9223 B	9223 B-97
	Colisure		9223 B	9223 B-97
	Colilert-18	9223 B	9223 B	9223 B-97
Enterococci	Multiple-Tube Technique			9230 B-04

<b>Alternative testing methods for contaminants listed at 40 CFR 141.704(b)</b>		
Organism	Methodology	SM 20 <sup>th</sup> Edition <sup>6</sup>
<i>E. coli</i>	Membrane Filtration, Two Step	9222 D/9222 G

<b>Alternative testing methods for contaminants listed at 40 CFR 143.4(b)</b>					
Contaminant	Methodology	EPA Method	ASTM <sup>4</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>
Aluminum	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2 <sup>2</sup>			
	Atomic Absorption; Direct			3111 D	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Chloride	Silver Nitrate Titration		D 512-04 B	4500-Cl <sup>-</sup> B	
	Ion Chromatography			4110 B	
	Potentiometric Titration			4500-Cl <sup>-</sup> D	
Color	Visual Comparison			2120 B	
Foaming Agents	Methylene Blue Active Substances (MBAS)			5540 C	
Iron	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Manganese	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Odor	Threshold Odor Test			2150 B	

<b>Alternative testing methods for contaminants listed at 40 CFR 143.4(b)</b>					
Contaminant	Methodology	EPA Method	ASTM <sup>4</sup>	SM 21 <sup>st</sup> Edition <sup>1</sup>	SM Online <sup>3</sup>
Silver	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct			3111 B	
	Atomic Absorption; Furnace			3113 B	
	Inductively Coupled Plasma			3120 B	
Sulfate	Ion Chromatography			4110 B	
	Gravimetric with ignition of residue			4500-SO <sub>4</sub> <sup>-2</sup> C	4500-SO <sub>4</sub> <sup>-2</sup> C-97
	Gravimetric with drying of residue			4500-SO <sub>4</sub> <sup>-2</sup> D	4500-SO <sub>4</sub> <sup>-2</sup> D-97
	Turbidimetric method			4500-SO <sub>4</sub> <sup>-2</sup> E	4500-SO <sub>4</sub> <sup>-2</sup> E-97
	Automated methylthymol blue method			4500-SO <sub>4</sub> <sup>-2</sup> F	4500-SO <sub>4</sub> <sup>-2</sup> F-97
Total Dissolved Solids	Total Dissolved Solids Dried at 180 deg C			2540 C	
Zinc	Axially viewed inductively coupled plasma-atomic emission spectrometry (AVICP–AES)	200.5, Revision 4.2			
	Atomic Absorption; Direct Aspiration			3111 B	
	Inductively Coupled Plasma			3120 B	

<sup>1</sup> Standard Methods for the Examination of Water and Wastewater, 21<sup>st</sup> edition (2005). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.

<sup>2</sup> EPA Method 200.5, Revision 4.2. “Determination of Trace Elements in Drinking Water by Axially Viewed Inductively Coupled Plasma-Atomic Emission Spectrometry.” 2003. EPA/600/R-06/115. (Available at <http://www.epa.gov/nerlcwww/ordmeth.htm>.)

<sup>3</sup> Standard Methods Online are available at <http://www.standardmethods.org>. The year in which each method was approved by the Standard Methods Committee is designated by the last two digits in the method number. The methods listed are the only online versions that may be used.

<sup>4</sup> Available from ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or <http://astm.org>. The methods listed are the only alternative versions that may be used.

<sup>5</sup> Method D99-003, Revision 3.0. “Free Chlorine Species (HOCl<sup>-</sup> and OCl<sup>-</sup>) by Test Strip,” November 21, 2003. Available from Industrial Test Systems, Inc., 1875 Langston St., Rock Hill, SC 29730.

<sup>6</sup> Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> edition (1998). Available from American Public Health Association, 800 I Street, NW, Washington, DC 20001-3710.